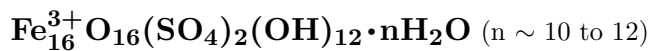


## Schwertmannite



©2001-2005 Mineral Data Publishing, version 1

**Crystal Data:** Tetragonal. *Point Group:*  $4/m$  (probable). As fibrous aggregates of poorly-crystalline needles, to 100  $\mu\text{m}$ , in films and thin to thick crusts.

**Physical Properties:** Hardness = n.d.  $D(\text{meas.}) = \text{n.d.}$   $D(\text{calc.}) = 3.77\text{--}3.99$

**Optical Properties:** Semitransparent. *Color:* Brownish yellow. *Streak:* Ocher-yellow. *Optical Class:* Uniaxial.  $\omega = \text{n.d.}$   $\epsilon = \text{n.d.}$

**Cell Data:** *Space Group:*  $P4/m$  (probable).  $a = 10.66(4)$   $c = 6.04(1)$   $Z = 1$

**X-ray Powder Pattern:** Pyhäsalmi mine, Finland; consists of broad bands. 2.55 (100), 3.39 (46), 4.86 (37), 1.51 (24), 2.28 (23), 1.66 (21), 1.46 (18)

Chemistry:	(1)	(2)	(3)
$\text{Fe}_2\text{O}_3$	62.6	71.0	74.01
$\text{H}_2\text{O}^+$	12.9		
$\text{H}_2\text{O}^-$	10.2		
$\text{H}_2\text{O}$		14.6	16.71
$\text{CO}_2$	1.5		
$\text{SO}_3$	12.7	14.4	9.28
Total	99.9	[100.0]	100.00

(1) Pyhäsalmi mine, Finland; Fe and S by ICP,  $\text{CO}_2$  by gas analyzer,  $\text{H}_2\text{O}$  by TGA. (2) Analysis (1) after deduction of  $\text{CO}_2$  and adsorbed  $\text{H}_2\text{O}^-$ , recalculated to 100.0%; corresponds to  $\text{Fe}_{16}\text{O}_{16}(\text{OH})_{9.6}(\text{SO}_4)_{3.2}\cdot 10\text{H}_2\text{O}$ . (3)  $\text{Fe}_{16}\text{O}_{16}(\text{SO}_4)_2(\text{OH})_{12}\cdot 10\text{H}_2\text{O}$ .

**Occurrence:** A secondary mineral precipitated by waters of pH 3–4.5 and high in iron sulfate content from the surface oxidation of metal sulfides.

**Association:** Goethite, jarosite, natrojarosite, ferrihydrite, sulfides.

**Distribution:** From the Pyhäsalmi mine, Oulu, Finland. At over 40 unspecified localities in Europe, North America, and Australia.

**Name:** For Udo Schwertmann (1927–), Professor of Soil Science, Technical University of Munich, Munich, Germany, who has worked on poorly crystalline products of weathering.

**Type Material:** Museum of Natural History, University of Helsinki, Helsinki, Finland, B8659.

**References:** (1) Bigham, J.M., L. Carlson, and E. Murad (1994) Schwertmannite, a new iron oxyhydroxysulphate from Pyhäsalmi, Finland, and other localities. *Mineral. Mag.*, 58, 641–648. (2) (1995) *Amer. Mineral.*, 80, 847 (abs. ref. 1).